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Modeling Coastal Ocean Optical Properties for Coupled Circulation and Ecosystem Models

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LONG-TERM GOAL

The overall goal of this work is to make use of existing data for the full spectral modeling of Case 2 waters. We will use of a version of Hydrolight tailored for use in coupled physical-biological-optical ecosystem models, and then utilize these models for understanding the coastal ocean optical environment.

OBJECTIVES

Our primary objectives include tailoring the Hydrolight ocean optical model for inclusion in coupled ecosystem models and the evaluation and development of new simplified models. In particular these models will be tested making use of existing data for Case 2 waters. A continuing objective is to evaluate the QA/QC for these data and to produce an internally consistent and wide ranging set of Case 2 observations for model testing.

APPROACH

Our approach is to test and evaluate these models across a wide range of Case 2 waters influenced by both biogeochemical and terrigenous variability. Early work for testing these models made use of the Plumes and Blooms (B&P) data set (<http://www.icess.ucsb.edu/PnB/PnB.html>) taken in Santa Barbara Channel and in Monterey Bay. We are also using HYCODE data obtained from the LEO-15 site as well as other selected coastal sites. These combined data sets include a wide range of bio-optical water types for the testing the application of Hydrolight & Ecolight by providing a range of physical & optical environments for subsequent ecological modeling.

This work is being done in collaboration with Dr. Curtis Mobley and Dr. Lydia Sundman of Sequoia Scientific who are co-funded with me to develop an extremely fast version of Hydrolight for applications using these data and for input to various models.

WORK COMPLETED

This year Mobley (Mobley et al., 2001 – see Mobley's report) continued the development of Ecolight and, using an internally consistent and wide ranging set of Case 2 observations, showed that using correct phase functions are essential to obtaining closure between model and data. Our effort

continues to focus on data analysis aimed at a wide range of iop & aop values for modeling of selected coastal waters. These data will be tested and used with Mobley's new version of Ecolight.

RESULTS

A special version of Hydrolight 4.0 (see Mobley) has been developed for use in coupled ecosystem models that is significantly faster than the standard code. Our selected data are being used to test both this special version, with comparison with the original version, as well as for internal consistency of the observed data. We expect to bring this work to closure within the next several months.

IMPACT/APPLICATION

This work will provide an accurate, optimized, and fully tested radiative transfer model for coastal (Case 2) waters. In turn, this model will provide a means of remotely and accurately estimating optical properties in these waters and provide a solid theoretical basis for developing accurate proxy measures of important parameters within these waters. Further, these results will significantly advance our ability to optically model Case 2 waters and provide important input to coupled physical and ecological models.

TRANSITIONS

Beta-test versions of the optimized Hydrolight 4.0 and Ecolight code have been delivered to us by Drs. Mobley and Sundman. We are working with them to test this version with the above data.

RELATED PROJECTS

The Plumes and Blomes program continues to obtain bio-optical data within Santa Barbara Channel. In addition, the Palmer LTER program has collected a unique bio-optical data set (including the first iop data) from the waters of the western Antarctic Peninsula.